

Listing of Claims:

1. An integrated circuit package comprising,
 - (a) a lead frame comprising:
 - a die attach platform; and
 - a plurality of elongated leads which are electrically isolated from said die attach platform, each of said elongated leads including a circular portion formed as an attachment pad; and
 - (b) a substrate, having first and second surfaces on opposite sides of said substrate, for providing rigid support to said lead frame, said substrate contacting said lead frame on said first surface and having vias of non-circular cross sections to allow electrical connections between said first and second surfaces.
2. The package of claim 1, further comprising a first bus bar which is electrically isolated from said die attach platform and said plurality of elongated leads.
3. The package of claim 2 wherein:
 - said lead frame further comprises a second bus bar which is electrically isolated from said die attach platform, said plurality of elongated leads, and said first bus bar;
 - said die attach pad is positioned between said first and second bus bars; and
 - said plurality of elongated leads extend radially away from said first and second bus bars and said die attach platform.
4. The package of claim 3 further comprising an integrated circuit chip mounted on said die attach platform, said integrated circuit chip having a plurality of power I/O pads, a plurality of ground I/O pads, and a plurality of signal I/O pads, wherein:

each of said plurality of signal I/O pads is electrically connected with a selected one of said plurality of leads;

said plurality of power I/O pads are electrically connected to said first bus bar; and

said plurality of ground I/O pads are electrically connected to said second bus bar.

5. The package of claim 3 further comprising an integrated circuit chip mounted on said die attach platform, said integrated circuit chip having a plurality of power I/O pads, a plurality of ground I/O pads, and a plurality of signal I/O pads, wherein:

each of said plurality of signal I/O pads is electrically connected with a selected one of said plurality of leads;

said plurality of power I/O pads are electrically connected to said first bus bar or said second bus bar; and

said plurality of ground I/O pads are electrically connected to said die attach platform.

6. The package of claim 1, wherein an integrated circuit chip is attached on said die attach platform, said package further comprising:

a mask layer formed on said second surface, said mask layer defining a plurality of openings exposing said vias; and

a plurality of solder balls, each of said plurality of solder balls being electrically connected to one of said attachment pads by solder through one of said openings and one of said vias.

7. The package of claim 6 wherein said mask layer comprises a solder mask.

8. The package of claim 7 wherein said mask layer comprises a plated layer, the material of

said plating layer being resistant to solder flow.

9. The package of claim 4 wherein:

said first bus bar is electrically connected to one of said plurality of leads that is designated to be electrically connected to the external power supply of said integrated circuit chip;

said second bus bar is electrically connected to the one of said plurality of leads that is designated to be electrically connected to ground potential; and

said lead frame and said integrated circuit chip are encapsulated in a protective casing.

10. In an integrated circuit (IC) package for accommodating an IC chip, wherein said IC chip includes a plurality of I/O pads for signal communications and a portion of said plurality of said I/O pads require a common signal, a method comprising the steps of:

providing a lead frame having (a) a die attach platform; and (b) a plurality of leads, each lead having a circular portion formed as an attachment pad;

providing a substrate having first and second surfaces on opposite sides of said substrate to provide rigid support to said lead frame, said substrate having vias of non-circular cross sections to allow electrical connections between said first and second surfaces;

attaching said lead frame to said first surface of said substrate;

attaching said IC chip to said die attach platform;

electrically connecting said [said] I/O pads to said bus bar and said attachment pads;

providing a solder mask on said second surface of said substrate, said solder masks having openings corresponding to said vias; and

attaching solder balls to said solder mask and providing a flow of solder into said opening and said vias, said solder reaching said attachment pads so that an electrical connection is made between each solder ball and an I/O pad of said I/C chip.

11. (Twice Amended) An integrated circuit package comprising:

a lead frame including a die attach platform, a plurality of contacts that are spaced apart from the die attach platform and a bus bar that is positioned between the die attach platform and at least some of the contacts, wherein bottom surfaces of the die attach platform, the contacts and the bus bar are substantially co-planar, and wherein each of the contacts includes a portion that forms an attachment pad;

a die carried by the die attach platform and electrically connected to the bus bar and at least some of the contacts; and

a protective casing covering the die and the lead frame while leaving bottom surfaces of the die attach platform, the bus bar and the conductive contacts exposed, wherein encapsulation material that forms the protective casing is exposed at a bottom surface of the package to physically isolate the bus bar from at least some of the conductive contacts, whereby the attachment pads are exposed at the bottom surface of the package.

12. An integrated circuit package as recited in claim 11 wherein the bus bar is a first bus bar, the integrated circuit further comprising a second bus bar that is also positioned between the die attach platform and some of the contacts.

13. An integrated circuit package as recited in claim 12 wherein the first and second bus bars are located on opposite sides of the die attach platform.

14. An integrated circuit package as recited in claim 11 further comprising bonding wires for electrically connecting the die to the bus bar and the contacts.

15. An electronic module comprising:
an integrated circuit package as recite in claim 11 wherein ground pads on the die are
electrically connected to the die attach platform; and
a printed circuit board, wherein the die attach platform is directly electrically connected
to a ground on the printed circuit board.
16. An electronic module as recited in claim 15 wherein the die attach platform is directly
electrically connected to the ground on the printed circuit board by soldering.
17. An electronic module comprising:
an integrated circuit package as recite in claim 11; and
a printed circuit board, wherein the bus bar is directly electrically connected to the
printed circuit board.
18. An electronic module as recited in claim 17 wherein the bus bar is a first bus bar, the
integrated circuit further comprising a second bus bar that is also positioned between the die
attach platform and some of the contacts and wherein both the first and second bus bars are
directly electrically connected to the printed circuit board.
19. (Twice Amended) An electronic module comprising an integrated circuit package and a
printed circuit board, the printed circuit board having a ground, wherein the integrated circuit
package comprises:
a lead frame including a die attach platform and a plurality of contacts, wherein bottom
surfaces of the die attach platform and the contacts are substantially co-planar, the die attach
platform being directly electrically connected to the ground on the printed circuit board;

a die carried by the die attach platform, the die having a plurality of signal pads that are electrically connected to at least some of the contacts, and at least one ground pad that is electrically connected to the die attach platform; and

a protective casing covering the die and the lead frame while leaving bottom surfaces of the die attach platform and the conductive contacts exposed, wherein encapsulation material that forms the protective casing is exposed at a bottom surface of the package to physically isolate the die attach platform from at least some of the conductive contacts, and wherein the exposed bottom surfaces of the contacts form attachment pads.

20. A module as recited in claim 19 wherein the die attach platform is directly electrically connected to the ground on the printed circuit board by soldering.

21. A module as recited in claim 19 wherein the lead frame further includes a bus bar positioned between the die attach platform and at least some of the contacts, and wherein the bus bar is directly electrically connected to the printed circuit board.

22. A module as recited in claim 19 wherein the lead frame further includes a plurality of bus bars positioned between the die attach platform and at least some of the contacts, and wherein each bus bars directly electrically connected to the printed circuit board.

23. (Amended) An integrated circuit package comprising:

a lead frame including a die attach platform, a plurality of contacts that are spaced apart from the die attach platform and a bus bar that is positioned between the die attach platform and at least some of the contacts, wherein bottom surfaces of the die attach platform, the contacts and

the bus bar are substantially co-planar, wherein each of the contacts includes a portion that forms an attachment pad;

a die carried by the die attach platform and electrically connected to the bus bar and at least some of the contacts; and

a protective casing covering the die and the lead frame while leaving bottom surfaces of the die attach platform, the bus bar and the conductive contacts exposed, wherein encapsulation material that forms the protective casing is exposed at a bottom surface of the package to physically isolate the bus bar from at least some of the conductive contacts; and

wherein the integrated circuit package may be attached to a substrate by soldering the attachment portions of the lead frame to the substrate.